

CLAIMS

1. A composition to repel or kill insects, fungi, nematodes and bacteria, comprising, as an active ingredient, an essential oil or a component thereof, wherein said essential oil or component thereof is derived from at least one plant species in the Family *Labiatae* and *Umbellifera*.
2. The composition of Claim 1 wherein said plant species is at least one species of a genera selected from the group consisting of *Thymbra*, *Satureja*, *Origanum*, *Corydothymus*, *Pinpinella* and *Foeniculum*.
3. The composition of Claim 1 wherein said plant species is selected from the group consisting of *Thymbra spicata* var. *spicata*, *Satureja thymbra*, *Origanum majorana*, *Corydothymus capitatus*, *Origanum vulgare*, *Origanum solymicum*, *Origanum spyleum*, *Origanum bilgeri*, *Origanum minutiflorum*, *Origanum saccatum*, *Origanum sriacum*, *Origanum onites*, *Origanum majorana*, *Pinpinella anisum*, and *Foeniculum vulgare*.
4. The composition of Claim 3 wherein said plant species is selected from the group consisting of *Thymbra spicata* var. *spicata* (L) Line Ant97- 364-48, *Satureja thymbra* (L) Line Ant98-28-103, *Pinpinella anisum* (L) Line Ant98-223-137, and *Foeniculum vulgare* (L) Line Ant98-89-62.
5. The composition of Claim 1 wherein said essential oil or component thereof comprises at least one compound selected from the group consisting of *cis*-anethole, *trans*-anethole,

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anisaldehyde, anis ketone, anisole, β -bisabolene, borneol, bornyl acetate, cadinene, camphene, camphor, Δ -3-carene, Δ -4-carene, carophyllene, carvone, carvacrol, γ -caryophyllene, cinnamic aldehyde, citral, citronellal, cineol, 1,8-cineole, p -cymene, p -cymene-8-ol, decanal, estragole, eugenol, eugenyl acetate, α -fenchene, fenchole, fenchone, geranial, geraniol, geranyl acetate, isoborneol, lavanduol, limonene, linalool, linalyl acetate, menthol, menthone, menthyl acetate, *cis*- p -menth-2-en-1-ol, *trans*- p -menth-2-en-1-ol, methoxy phenyl acetone, methyl chavicol, methyleugenol, methylinone, 2-methylpentan-3-one, myrcene, nerol, nonanal, *cis*- β -ocimene, *trans*- β -ocimene, octanal, 3-octanol, α -pinene, β -pinene, α -phelladrene, β -phelladrene, pulegone, sabinene, *cis*-sabinene hydrate, *trans*-sabinene hydrate, γ -terminene, terpenyl acetate, α -terpinene, γ -terpinene, terpinene-4-ol, α -terpineol, β -terpineol, terpinolene, 2,3,5,6-tetramethylphenol, α -thujene, thymil acetate, thymol, and tricyclene.

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6. The composition of Claim 4, wherein said essential oil or component thereof is at least one compound selected from the group consisting of carvacrol, thymol, cymene and anethole.
7. The composition of Claim 6 wherein said component is anethole.
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8. The composition of Claim 7 wherein said component is *trans*-anethole.
9. The composition of Claim 1 wherein said essential oil or component thereof is present in an amount of at least about 1 ppm.

10. The composition of Claim 1 further comprising a carrier component for soil application.

11. The composition of Claim 8 wherein said carrier component is vermiculite or perlite.

12. The composition of Claim 1 in a liquid form.

13. The composition of Claim 12 wherein said active ingredient is emulsified in water.

14. The composition of Claim 1 wherein said active ingredient is present in a paint.

15. The composition of Claim 1 formulated for vaporization.

16. The composition of Claim 1 formulated as an aerosol.

17. The composition of Claim 1 formulated as a cream.

18. The composition of Claim 1 formulated as a powder.

19. The composition of Claim 1 formulated as a dilution in a carrier oil.

20. The composition of Claim 1 formulated with paraffin.

21. The composition of Claim 1 wherein said essential oil is present in an amount of about 0.5 to 90%.

22. The composition of Claim 1 further comprising a detergent for emulsification.

23. The composition of Claim 22 wherein said detergent is Tween 20.

24. A method of protecting a plant against pathogenic or parasitic organisms comprising applying to said plant a composition comprising, as an active ingredient, an essential oil or at least one component thereof in an amount sufficient to prevent adverse effects to the plant caused by said pathogenic organisms.

25. The method of Claim 24 wherein said pathogenic or parasitic organisms are at least one organism selected from the group consisting of nematodes, bacteria, fungi and insects.

26. The method of Claim 25 wherein said insects are selected from the group consisting of mites, ants, aphids, and termites.

27. The method of Claim 26 wherein said insects are at least one species selected from the group consisting of *Tetranychus*.

28. The method of Claim 27 wherein said insects are *Tetranychus cinnabarinus*.

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Sub 29. The method of Claim 24 wherein said bacteria are at least one species selected from the group consisting of *Erwinia*, *Xanthomonas*, *Pseudomonas*, *Clavibacter*, and *Agrobacterium*.

5 30. The method of Claim 29 wherein said bacteria are at least one species selected from the group consisting of *Agrobacterium tumefaciens*, *Clavibacter michiganensis*, *Erwinia amylovora*, *Erwinia carotovora*, *Pseudomonas syringae*, and *Xanthomonas axonopodis*.

31. The method of Claim 30 wherein said fungi are at least one species selected from the group consisting of *Fusarium*, *Rhizoctonia*, *Sclerotinia*, and *Phytophthora*.

32. The method of Claim 31 wherein said fungi are at least one species selected from the group consisting of *Fusarium moniliforme*, *Rhizoctonia solani*, *Sclerotinia sclerotium*, *Phytophthora capsici* and *Phytophthora fragaria*.

33. The method of Claim 24 wherein said essential oil or component thereof is derived from at least one essential oil producing plant species of a genera selected from the group consisting of *Thymbra*, *Satureja*, *Origanum*, *Corydothymus*, *Pinpinella* and *Foeniculum*.

34. The method of Claim 24 wherein said essential oil producing plant species is selected from the group consisting of *Thymbra spicata* var. *spicata*, *Satureja thymbra*, *Origanum majorana*, *Corydothymus capitatus*, *Origanum vulgare*, *Origanum solymicum*, *Origanum spyleum*, *Origanum bilgeri*, *Origanum minutiflorum*, *Organum saccatum*, *Origanum*

sriacum, *Origanum onites*, *Origanum majorana*, *Pinpinella anisum*, and *Foeniculum vulgare*.

35. The method of Claim 24 wherein said essential oil producing plant species is selected from the group consisting of *Thymbra spicata* var. *spicata* (L) Line Ant97- 364-48, *Satureja thymbra* (L) Line Ant98-28-103, *Pinpinella anisum* (L) Line Ant98-223-137, and *Foeniculum vulgare* (L) Line Ant98-89-62.

36. The method of Claim 24 wherein said essential oil or component thereof comprises at least one compound selected from the group consisting of cis-anethole, trans-anethole, anisaldehyde, anis ketone, anisole, β -bisabolene, borneol, bornyl acetate, cadinene, camphene, camphor, Δ -3-carene, Δ -4-carene, carophyllene, carvone, carvacrol, γ -caryophyllene, cinnamic aldehyde, citral, citronellal, cineol, 1,8-cineole, *p*-cymene, *p*-cymene-8-ol, decanal, estragole, eugenol, eugenyl acetate, α -fenchene, fenchole, fenchone, geranial, geraniol, geranyl acetate, isoborneol, lavanduol, limonene, linalool, linalyl acetate, menthol, menthone, menthyl acetate, *cis*-p-menth-2-en-1-ol, *trans*-p-menth-2-en-1-ol, methoxy phenyl acetone, methyl chavicol, methyleugenol, methylinone, 2-methylpentan-3-one, myrcene, nerol, nonanal, *cis*- β -ocimene, *trans*- β -ocimene, octanal, 3-octanol, α -pinene, β -pinene, α -phelladrene, β -phelladrene, pulegone, sabinene, *cis*-sabinene hydrate, *trans*-sabinene hydrate, γ -terminene, terpenyl acetate, α -terpinene, γ -terpinene, terpinene-4-ol, α -terpineol, β -terpineol, terpinolene, 2,3,5,6-tetramethylphenol, α -thujene, thymil acetate, thymol, and tricyclene.

Sub 37. The method of Claim 24 wherein said essential oil or component thereof is at least one compound selected from the group consisting of carvacrol, thymol, cymene and anethole.

38. The method of Claim 24 wherein said component is anethole.

39. The method of Claim 24 wherein said component is *trans*-anethole.

40. The method of Claim 24 wherein said essential oil or component thereof is present in an amount of at least about 1 ppm.

41. A method of protecting plants from pathogens comprising inoculating the soil surrounding said plants with a *Pseudomonas fluorescens* TR97.

42. The method of claim 24 wherein said composition is applied by spraying.

43. The method of Claim 42 further comprising solarization.

44. The method of Claim 24 wherein said composition is applied by fogging.

45. The method of Claim 24 wherein said composition is applied in irrigation water.

46. The method of Claim 24 wherein said composition further comprises a carrier, and said composition is applied in the soil around the plant.

47. The method of Claim 46 wherein said carrier is selected from the group consisting of perlite, commercially available dust preparations, commercially available granule preparations and vermiculite.

48. The method of Claim 24 wherein said composition further comprises paint.

49. A fungicide composition comprising an essential oil, or at least one component thereof from *Laurus nobilis*.

50. A method of inhibiting fungal infections of plants comprising applying a composition comprising an essential oil or at least one active component thereof to the plant, wherein said essential oil or active component thereof is from *Laurus nobilis*.

51. A method of preserving food for storage by repelling or killing insects comprising applying a composition comprising, as an active ingredient, an essential oil or a component thereof, wherein said essential oil or component thereof is derived from at least one plant species in the Family *Labiatae* and *Umbellifera*.

52. The method of Claim 51 wherein said plant species is at least one species of a genera selected from the group consisting of *Thymbra*, *Satureja*, *Origanum*, *Corydothymus*, *Pinpinella* and *Foeniculum*.

53. The method of Claim 51 wherein said plant species is selected from the group consisting of *Thymbra spicata* var. *spicata*, *Satureja thymbra*, *Origanum majorana*, *Corydothymus capitatus*, *Origanum vulgare*, *Origanum solymicum*, *Origanum spyleum*, *Origanum bilgeri*, *Origanum minutiflorum*, *Origanum saccatum*, *Origanum sriacum*, *Origanum onites*, *Origanum majorana*, *Pinpinella anisum*, and *Foeniculum vulgare*.
54. The method of Claim 51 wherein said plant species is selected from the group consisting of *Thymbra spicata* var. *spicata* (L) Line Ant97- 364-48, *Satureja thymbra* (L) Line Ant98-28-103, *Pinpinella anisum* (L) Line Ant98-223-137, and *Foeniculum vulgare* (L) Line Ant98-89-62.
55. The method of Claim 51 wherein said essential oil or component thereof comprises at least one compound selected from the group consisting of *cis*-anethole, *trans*-anethole, anisaldehyde, anis ketone, anisole, β -bisabolene, borneol, bornyl acetate, cadinene, camphene, camphor, Δ -3-carene, Δ -4-carene, carophyllene, carvone, carvacrol, γ -caryophyllene, cinnamic aldehyde, citral, citronellal, cineol, 1,8-cineole, *p*-cymene, *p*-cymene-8-ol, decanal, estragole, eugenol, eugenyl acetate, α -fenchene, fenchole, fenchone, geranial, geraniol, geranyl acetate, isoborneol, lavanduol, limonene, linalool, linalyl acetate, menthol, menthone, menthyl acetate, *cis*-p-menth-2-en-1-ol, *trans*-p-menth-2-en-1-ol, methoxy phenyl acetone, methyl chavicol, methyleugenol, methylinone, 2-methylpentan-3-one, myrcene, nerol, nonanal, *cis*- β -ocimene, *trans*- β -ocimene, octanal, 3-octanol, α -pinene, β -pinene, α -phelladrene, β -phelladrene, pulegone, sabinene, *cis*-sabinene hydrate, *trans*-sabinene hydrate, γ -terminene, terpenyl acetate, α -terpinene, γ -

A 3 terpinene, terpinene-4-ol, α -terpineol, β -terpineol, terpinolene, 2,3,5,6-tetramethylphenol, α -thujene, thymil acetate, thymol, and tricyclene.

56. The method of Claim 51, wherein said essential oil or component thereof is at least one compound selected from the group consisting of carvacrol, thymol, cymene and anethole.

57. The method of Claim 51 wherein said component is anethole.

58. The method of Claim 51 wherein said component is *trans*-anethole.

59. The method of Claim 51 wherein said composition further comprises paraffin.

60. The method of Claim 51 wherein said insects are at least one species of the genera selected from the group consisting of *Tribolium*, *Sitophilus*, *Ephestia* and *Ceratitus*.

61. The method of Claim 51 wherein said insects are selected from the group consisting of *Tribolium confusum*, *Sitophilus zeamais*, *Sitophilus oryzae*, *Ephestia kuehniella* and *Ceratitus capita*.

62. A method of treating pepper root rot disease caused by *Phytophthora capsici* in an affected plant comprising administering an aqueous emulsion comprising, as an active ingredient, an essential oil or at least one component thereof, to the soil about said affected plant.

63. The method of Claim 62 wherein said essential oil is derived from a plant of the Family selected from the group consisting of *Labiatae* and *Umbelliferae*.

5 64. The method of Claim 62 wherein said plant species is selected from the group consisting of *Thymbra spicata* var. *spicata*, *Satureja thymbra*, *Origanum majorana*, *Corydothymus capitatus*, *Origanum vulgare*, *Origanum solymicum*, *Origanum spyleum*, *Origanum bilgeri*, *Origanum minutiflorum*, *Origanum saccatum*, *Origanum sriacum*, *Origanum onites*, *Origanum majorana*, *Pinpinella anisum*, and *Foeniculum vulgare*.

10 65. The method of Claim 62 wherein said plant species is selected from the group consisting of *Thymbra spicata* var. *spicata* (L) Line Ant97- 364-48, *Satureja thymbra* (L) Line Ant98-28-103, *Pinpinella anisum* (L) Line Ant98-223-137, and *Foeniculum vulgare* (L) Line Ant98-89-62.

15 66. The method of Claim 62 wherein said component of said essential oil is at least one compound selected from the group consisting of cis-anethole, trans-anethole, anisaldehyde, anis ketone, anisole, β -bisabolene, borneol, bornyl acetate, cadinene, camphene, camphor, Δ -3-carene, Δ -4-carene, carophyllene, carvone, carvacrol, γ -caryophyllene, cinnamic aldehyde, citral, citronellal, cineol, 1,8-cineole, *p*-cymene, *p*-cymene-8-ol, decanal, estragole, eugenol, eugenyl acetate, α -fenchene, fenchole, fenchone, geranial, geraniol, geranyl acetate, isoborneol, lavanduol, limonene, linalool, linalyl acetate, menthol, menthone, menthyl acetate, *cis*-p-menth-2-en-1-ol, *trans*-p-

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menth-2-en-1-ol, methoxyphenyl acetone, methyl chavicol, methyleugenol, methylinone, 2-methylpentan-3-one, myrcene, nerol, nonanal, *cis*- β -ocimene, *trans*- β -ocimene, octanal, 3-octanol, α -pinene, β -pinene, α -phelladrene, β -phelladrene, pulegone, sabinene, *cis*-sabinene hydrate, *trans*-sabinene hydrate, γ -terminene, terpenyl acetate, α -terpinene, γ -terpinene, terpinene-4-ol, α -terpineol, β -terpineol, terpinolene, 2,3,5,6-tetramethylphenol, α -thujene, thymil acetate, thymol, and tricyclene.

67. The method of Claim 62 wherein said active ingredient is at least one compound selected from the group consisting of carvacrol, thymol, cymene and anethole.
68. The method of Claim 62 wherein said active ingredient is anethole.
69. The method of Claim 62 wherein said active ingredient is *trans*-anethole.

70. A method of repelling or killing insects comprising applying a composition to an area, wherein said composition comprises, as an active ingredient, an essential oil from at least one plant selected from the genera *Labiata* and *Umbellifera*.

71. The method of Claim 70 wherein said plant species is selected from the group consisting of *Thymbra spicata* var. *spicata*, *Satureja thymbra*, *Origanum majorana*, *Corydothymus capitatus*, *Origanum vulgare*, *Origanum solymicum*, *Origanum spyleum*, *Origanum bilgeri*, *Origanum minutiflorum*, *Origanum saccatum*, *Origanum sriacum*, *Origanum onites*, *Origanum majorana*, *Pinpinella anisum*, and *Foeniculum vulgare*.

72. The method of Claim 70 wherein said plant species is selected from the group consisting of *Thymbra spicata* var. *spicata* (L) Line Ant97- 364-48, *Satureja thymbra* (L) Line Ant98-28-103, *Pinpinella anisum* (L) Line Ant98-223-137, and *Foeniculum vulgare* (L) Line Ant98-89-62.

73. The method of Claim 70 wherein said component of said essential oil is at least one compound selected from the group consisting of cis-anethole, trans-anethole, anisaldehyde, anis ketone, anisole, β -bisabolene, borneol, bornyl acetate, cadinene, camphene, camphor, Δ -3-carene, Δ -4-carene, carophyllene, carvone, carvacrol, γ -caryophyllene, cinnamic aldehyde, citral, citronellal, cineol, 1,8-cineole, *p*-cymene, *p*-cymene-8-ol, decanal, estragole, eugenol, eugenyl acetate, α -fenchene, fenchole, fenchone, geranial, geraniol, geranyl acetate, isoborneol, lavanduol, limonene, linalool, linalyl acetate, menthol, menthone, menthyl acetate, *cis*-p-menth-2-en-1-ol, *trans*-p-menth-2-en-1-ol, methoxy phenyl acetone, methyl chavicol, methyleugenol, methylinone, 2-methylpentan-3-one, myrcene, nerol, nonanal, *cis*- β -ocimene, *trans*- β -ocimene, octanal, 3-octanol, α -pinene, β -pinene, α -phelladrene, β -phelladrene, pulegone, sabinene, *cis*-sabinene hydrate, *trans*-sabinene hydrate, γ -terminene, terpenyl acetate, α -terpinene, γ -terpinene, terpinene-4-ol, α -terpineol, β -terpineol, terpinolene, 2,3,5,6-tetramethylphenol, α -thujene; thymil acetate, thymol, and tricyclene.

74. The method of Claim 70 wherein said active ingredient is at least one compound selected from the group consisting of carvacrol, thymol, cymene and anethole.

75. The method of Claim 70 wherein said active ingredient is anethole.

76. The method of Claim 70 wherein said active ingredient is *trans*-anethole.

77. The method of Claim 70 wherein said active ingredient is emulsified in water, wherein said composition is formulated as a spray, and wherein said active ingredient is present in a concentration of at least about 1 ppm.

78. The method of Claim 70 wherein said active ingredient is combined with at least one inactive oil, wherein said composition is formulated as a fogging vapor, and wherein said essential oil is atomized to a concentration of about 0.25 to 1000 ppm/m² of area.

79. The method of Claim 70 wherein said composition further comprises a carrier.

80. The method of Claim 79 wherein said carrier is selected from the group consisting of perlite, commercially available dust preparations, commercially available granule preparations, and vermiculite.

81. The method of Claim 70 wherein said composition is formulated as a cream.

82. The method of Claim 70 wherein said composition is formulated as a powder.

83. The method of Claim 70 wherein said composition is formulated in paraffin.

84. The method of Claim 70 wherein said composition is formulated in paint.

5 85. The method of Claim 84 wherein said paint is an oil-based paint.

86. The method of Claim 70 wherein said insects are at least one selected from the group consisting of flies, mosquitoes, aphids, fleas, ticks, spiders, cockroaches, ants, termites, and mites.

87. A method of protecting plants from pathogenic or parasitic organisms comprising treating seeds of said plants with a composition comprising at least one essential oil, at least one material that induces systemic disease resistance in plants and *Psuedomonas fluorescens*, and thereafter cultivating said seeds.

88. The method of Claim 87 wherein said material that induces systemic disease resistance in plants is selected from the group consisting of chitin and chitosan.

89. The composition of Claim 1 further comprising at least one other pesticide.

90. The composition of Claim 49 wherein said composition further comprises at least one other fungicide.

91. The method of Claim 24 wherein said composition further comprises at least one other pesticide.

92. The method of Claim 41 further comprising the application of at least one other pesticide.

93. The method of Claim 50 wherein said composition further comprises at least one other fungicide.

94. The method of Claim 51 wherein said composition further comprises at least one other pesticide.
95. The method of Claim 62 wherein said aqueous emulsion further comprises at least one other pesticide.
- 5 96. The method of Claim ~~70~~ wherein said composition further comprises at least one other pesticide.

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